

**SEA-BASED LOGISTICS  
And  
LESSONS FROM THE FALKLANDS**



**D. A. Schrady**  
May 2000

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**The Institute for Joint Warfare Analysis  
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**NAVAL POSTGRADUATE SCHOOL**  
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# SEA-BASED LOGISTICS AND LESSONS FROM THE FALKLANDS

## EXECUTIVE SUMMARY

The Marine Corps is developing the concepts of Operational Maneuver From The Sea (OMFTS) and Ship To Objective Maneuver (STOM) as their amphibious warfare paradigm for the future. Both concepts call for Marine amphibious operations to originate from ships over the horizon and to proceed directly to key objectives without a lengthy pause to build-up forces and supplies at the beachhead. Ideally all of the maneuver force logistics would be sea-based and there would be little or no logistics footprint ashore. This is the general idea behind the supporting concept of Sea-Based Logistics (SBL). STOM will soon be feasible because of the enhanced tactical capabilities provided by the new MV-22 tiltrotor aircraft, the advanced amphibious assault vehicle (AAAV), and the existing landing craft air cushion (LCAC).

Much thought has been going into developing these concepts and identifying the conditions or capabilities needed to make them viable. SBL has been the subject of a number of studies involving the ton-miles arithmetic of the resupply requirements of the maneuver forces ashore and whether the transportation assets within the amphibious ships of the sea base can accomplish the required deliveries. The answer to this question depends on the size and nature of the forces ashore, their distance from the sea base, and a number of other factors. Several recent studies of the feasibility of SBL are reviewed to compare their assumptions and results. Most of these studies identify conditions under which resupply is not feasible without using surface delivery over the beach.

The viability of OMFTS, STOM, and sea-based logistics is influenced by a number of other issues as well. The issues include whether the U.S. Navy has control of the sea and air, the competition between operations and logistics for sorties the sea-based Marine transport aircraft can generate, the ability of the amphibious warfare ships of the sea base

to selectively offload over time as required, the availability of Navy Combat Logistics Force ships to replenish the fuel, stores, and ammunition of the ships of the sea base, the capability and sustainability of Navy surface fire support, and the command and control structure involving the naval forces commander, the amphibious task force commander, and the land force commander. Each of these issues is discussed as it impacts on the prospects for successful OMFTS, STOM, and SBL operations.

The 1982 Falklands War provides a recent and relevant example of OMFTS and the difficulty of providing combat service support to forces in combat. STOM was most likely not intended, at least not in ship to objective movement form. Sea-based logistics was explicitly planned, though it became an early casualty of the inability of the Royal Navy to achieve air superiority. Sea control was defaulted to the British when the Argentine Navy withdrew after the sinking of the cruiser General Belgrano, but the Royal Navy did not have a mine countermeasures capability. The competition for helicopter sorties between the need to move troops and the need to move guns, ammunition, and even rations affected the pace of operations on the ground. The command and control arrangement involving an overall commander 8000 miles distant and separate on-scene commanders for the naval battle group, amphibious group, and land forces contributed to the lack of understand and mutual support required for expeditionary warfare.

The conclusion of this review is that many capabilities are required to successfully execute sea-based logistics. The Navy must attain and maintain sea control and air superiority or the ships of the sea base could be at risk. Mine countermeasures capability must be present or use of the surface for force deployment or resupply could be foreclosed. Air superiority and the suppression of enemy air defenses are necessary if vertical deployment and/or resupply are planned. Asset visibility and the ability to selectively offload the ships of the sea base over time are mandatory. The competition between operations and logistics for aircraft sorties must be managed. Competition can be minimized only by increasing the numbers or capabilities of the Marine transport aircraft available on the sea base ships. Replenishment of the ships of the sea base must be feasible as required; that is, there must be combat logistics force ships carrying Marine

ammunition and stores available for this purpose. Finally, the Navy and Marine Corps must have a rational command and control scheme and be well practiced in expeditionary warfare operations.

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*“The advantages of logistics afloat . . . . had long been recognized by many naval commanders, and no doubt by others who gave the matter analytical thought.”<sup>1</sup>*

## **Introduction**

The Marine Corps has proposed that the complementary concepts of Operational Maneuver From The Sea (OMFTS) and Ship To Objective Maneuver (STOM) lay the foundation for how they would like to fight in the future. Both concepts call for Marine amphibious operations to originate from ships over the horizon and to proceed directly to key objectives without a lengthy pause to build-up forces and supplies at the beachhead. Ideally all of the maneuver force logistics would be sea-based and there would be very little or no logistics footprint ashore. This is the general idea behind the supporting concept of Sea-Based Logistics (SBL).

Emphasis in OMFTS is on littoral regions. OMFTS uses the sea as maneuver space and requires a high degree of cooperation between forces afloat and forces ashore. OMFTS is not a new concept. There were many examples of OMFTS during the Second World War. The landing at Inchon in the Korean War is offered as a “classic from the past” in the Marine Corps concept paper on OMFTS.<sup>2</sup> However, the concept paper also refers to OMFTS as a “path to the future.” While OMFTS is not new and may be executed at some time in the future in its original “pause at the beachhead” form, STOM is new. STOM will soon be feasible because of enhanced tactical capabilities of the MV-22 tiltrotor aircraft, the new advanced amphibious assault vehicle (AAAV), and the existing landing craft, air cushion (LCAC). It is the new OMFTS with STOM that requires sea-based logistics.

OMFTS with STOM leaves open the issue of how the maneuver force is deployed. Surface deployment involving LCACs and AAAVs is envisioned. It is this option that allows the force to deploy ashore with armored combat vehicles (tanks, LAVs, AAAVs), and organic mobility assets (HMMWVs, trailers, and trucks). Once



ashore, the force would move out immediately to the objective without establishing a combat service support area on the beach. OMFTS/STOM deployment could also be by vertical means, but the tactical and logistical mobility of the force deployed would be limited. Of course OMFTS/STOM could employ both surface and vertical deployment.

Combat service support in OMFTS with STOM is to be provided from ships at sea substituting for a combat service support area ashore. Support includes supplies (ammo, fuel, water, rations, other), maintenance, and medical care. Supplies could be delivered by air or via surface transportation. Surface delivery involves opening/reopening/or maintaining a beachhead and interior lines of communication to the forces operating ashore. Some consider surface resupply infeasible and/or undesirable, suggesting that there is a dominant role for resupply by air.<sup>3</sup> It seems clear that either surface deployment or surface resupply could require effective mine countermeasures capabilities.

This report reviews several recent studies of sea-based logistics in support of OMFTS and STOM to contrast their assumptions and results. It then discusses some of the conditions that must prevail and issues that must be satisfactorily resolved for sea-based logistics to be a viable option. The balance of this report is an examination of the 1982 Falklands War as a case study of OMFTS with implications for sea-based logistics.

### **Studies of Sea-Based Logistics**

Sea-based logistics has been the subject of a number of analyses. A characteristic of most of the studies is that they have used relatively simple, deterministic, expected value models. Using logistic planning factors, they have performed the ton-miles arithmetic needed to determine the conditions under which the support requirements of the force ashore can be satisfied by available sea-based transportation assets. Data to support more sophisticated, stochastic analyses does not exist.

In one of the earliest studies, the Center for Naval Analysis (CNA) took a preliminary look at supply and transportation requirements for OMFTS, and the feasibility of meeting those requirements.<sup>4</sup> The study involved supporting the ground combat element (GCE) of a Marine Expeditionary Force ashore from the amphibious warfare ships with their embarked transport aircraft. It was assumed that ship loading plans and configurations facilitated selective offloading of supplies needed by the force ashore. The GCE was composed of 12,700 personnel including infantry, an AAV company, an artillery battalion, a LAR company, a tank company and combat engineers. Transport aircraft consisted of 108 MV-22 tilt-rotor aircraft and 32 CH-53E helicopters. The operational availabilities assumed were 85% for the MV-22 and 60% for the CH-53E. The average ship-to-objective distance in the study was 75 miles. Average sortie times were 1 hour for the MV-22 and 1.5 hours for the CH-53E.

The study considered the number of sorties required for resupply, troop movement, and MEDEVAC missions. Resupply requirements consisted of rations, water, fuel, and ammunition. The study noted that these commodities account for nearly 98% of the total weight of all resupply requirements. The troop movement requirement was to move 1000 troops each day. Twelve MV-22 aircraft are dedicated to MEDEVAC.

The CNA study concluded that all supply, troop movement, and MEDEVAC requirements could be met using only the available MV-22 aircraft. These aircraft were required to fly as many as 6.63 sorties per aircraft per day.

The Naval Studies Board of the National Research Council conducted a study at the request of the Chief of Naval Operations to determine the technological requirements, operational changes, and combat service support structure necessary to land and support dispersed units from the shoreline to 200 miles inland.<sup>5</sup> The Studies Board noted that there was a lack of a common understanding of OMFTS among members of the committee and among the Navy and Marine Corps personnel who were supporting the study effort. They also noted that OMFTS is open to a range of interpretations depending upon the resolution of six key features: (1) the composition of combat and logistics forces

ashore; (2) the role of naval fire support vis-à-vis ground artillery; (3) the availability of overseas ports and airfields; (4) sea base standoff distances and duration; (5) operating distances ashore; and (6) the transition to shore-based logistics. The Studies Board noted that OMFTS implies a dominant role for resupply by air because it would be unrealistic to assume that road networks and rear areas will be secure enough for truck convoys. The study concluded that, depending on the size and composition of the forces ashore and their distance from the sea base, the rotary-wing and tiltrotor aircraft planned will be insufficient to deliver all resupply requirements.

Officers in the Operational Logistics curriculum at the Naval Postgraduate School have written three theses on sea-based logistics. The earliest of these was the research of Lt. Mark Beddoes, USN.<sup>6</sup> Lieutenant Beddoes's goal was to develop pragmatic, quantitative estimates of how tactically constrained Navy ships will be while supporting OMFTS. His research focused on a Marine Expeditionary Unit (MEU)-sized force and allowed for the attrition of transport aircraft. He computed the maximum feasible ship-to-objective distances. These distances shrink over time due to aircraft attrition. His analysis assumed two plane sections and that deception sorties added to aircraft tasking. The analysis showed that anticipated future transport aircraft do not support a traditional ground force mix at the distances envisioned. He concluded that to realize OMFTS and still allow ships to maintain the desired standoff from shore requires a shift to more lethal Marine forces with much smaller logistical demands. He also concluded that until such a force is created, the Navy should plan on providing support to Marines from close to shore.

Capt. Robert Hagan, USMC, created five MEU-sized missions ranging from humanitarian assistance/disaster relief up the intensity scale to an enabling force operation.<sup>7</sup> For each mission, he created a force package of people and equipment and determined its daily sustainment requirements. Captain Hagan first calculated the time needed to establish each force ashore as a measure of the feasibility of such operations. All troops except equipment operators were air deployed but all equipment (HMMWVs and trailers, trucks, LAVs, Logistic Vehicle Systems) except artillery was moved on the



surface using LCACs. The disparity between surface movement time and air movement time demonstrates the ongoing requirement for synchronization between surface and air movements in an OMFTS environment. This analysis also sought to identify the logistics drivers, the commodities whose supply to the forces ashore was most difficult. The drivers were liquids, fuel and water. While this was demonstrated quantitatively by Hagan's analysis, it had been noted earlier.<sup>8</sup> The clear message is that low cost, low tech improvements in the means of transporting fuel and water could have a very significant payoff in OMFTS.

The main insight of Hagan's research is that there will be competition between operations and logistics for the available MV-22 sorties. He did not require two plane sections or deception flights, nor did he consider aircraft attrition. He did assume that the ship-to-objective distance is 100 miles. For certain of his postulated mission/force package combinations, all or nearly all available sorties are required for resupply leaving few or no MV-22 sorties for troop movement, MEDEVAC, or other operational tasking. Hagan assumed that the available MV-22s could sustain a rate of 3 sorties per day. This is far fewer than assumed in the CNA study cited, but is consistent with the assumption on sortie rates made in an earlier study for the Naval Studies Board,<sup>9</sup> and is only slightly higher than the maximum sustained sortie rates of most carrier-based aircraft.

Building a sea-based logistics decision support system (DSS) for MEU-sized operations was the thrust of the thesis of Capt. Norman Reitter, USMC.<sup>10</sup> The DSS was built to facilitate the collaborative mission planning and dialogue between operators and logisticians. The need for such capabilities has been noted in other studies.<sup>11</sup> The principal entities modeled in the DSS are forces and transport aircraft. In the setup phase, the force required for a given mission is constructed by selecting from a menu of combat, combat support, and combat service support force components. The combat forces range from an infantry fireteam to an infantry battalion. Combat support forces include an artillery battery, LAV detachment, AAV detachment, tank platoon, combat engineering detachment, and some combat service support units. Each force component has its associated logistics planning factors for rations, water, fuel, and ammunition. When the

force is constructed, its logistic support requirements are automatically aggregated. The next part of the DSS is the set of events in which the force participates over time. While rations and water are consumed daily independent of the activities or events of the force, the use of fuel and ammunition depends on events. The force events are movement to objective, assault, defense, etc. The force events are the means for reflecting the commander's concept of operations. Aircraft events include resupply, troop movement, and MEDEVAC. In recognition of the competition between operations and logistics for air assets discovered earlier, the DSS has an automated transport aircraft scheduler.

Since the number of MV-22 and CH-53E aircraft available in an amphibious readiness group is finite, Captain Reitter modeled each aircraft individually in terms of its accumulated flight hours, hours until its next maintenance action, and crew hours on a given day. His scheduler assigns available aircraft based upon lift requirements, distances, and other information. Multi-task sorties can be scheduled; i.e., transport fuel from the sea base to site A, move troops from site A to site B, and return to the sea base with casualties from site B. Infeasibilities, for example the requirement for more sorties in a given period of time than the available aircraft can generate, can be found during planning performed within the DSS and this allows the plan to be modified accordingly.

### **Sea-Based Logistics Issues**

While SBL is essential to the implementation of OMFTS with STOM and has been the subject of a number of studies, there are a number of issues associated with sea-based logistics being a viable option in future operations other than whether there is lift capacity to accomplish logistic resupply. The issues are the requirement for sea control and air superiority, aircraft range and payload tradeoffs, the need to manage the competition between operations and logistics for available aircraft sorties, the requirement to be able to selectively offload ships of the sea base, the capability of naval surface fire support, and the need for asset visibility and decision support software.

Sea control, air superiority and suppression of enemy air defenses are necessary for OMFTS, STOM, and SBL. Sea control and air superiority are necessary to protect the amphibious warfare ships serving as the sea base. Air superiority and suppression of enemy air defenses are necessary for SBL because neither the MV-22 nor the CH-53E is armed and able to defend itself. There has been discussion of escort of the MV-22 by either AV-8B Harrier aircraft or AH-1W Cobra armed helicopters. Neither can do the job well. The Harrier has the range, but the speed differential between it and the MV-22 with external load means that it would likely be detached escort with preparation of the landing zone. The Cobra can match speed with the MV-22 with external load, but not the MV-22 with an internal load (i.e., troops). Furthermore, the Cobra does not have the range to go much beyond a 100 nautical mile mission radius. This problem is the subject of a recent article that proposes development of an AV-22, an attack variant, to escort the MV-22.<sup>12</sup>

Range and payload tradeoffs have not been explicitly considered in the calculations of any of the studies to date. Payload and fuel share the difference between an aircraft's maximum gross weight and its empty weight. Payload decreases as range increases because the aircraft has to carry more fuel. Related directly to the range vs. payload issue is the distance from the sea base at which forces can operate and still be resupplied by aircraft. Much of the literature speaks of this distance being up to 250 miles.<sup>13</sup> For any of the five standard missions of the Medium Lift Replacement Study (these five missions are also the basis of the MV-22 flight test program), the maximum mission radius of both the MV-22 and the CH-53E is less than 250 miles.<sup>14</sup>

In considering the feasibility of sea-based logistics, it has often been implicitly assumed that all aircraft sorties could be dedicated to combat service support if required. Historically, such aircraft (CH-46 and CH-53 presently) have been in the Marine Air Combat Element primarily as tactical aircraft to move troops or artillery. The 1999 Naval Studies Board report notes "OMFTS will likely require a much greater allocation of available air assets for logistics missions than has been the case in the past." There



will be competition between operations and logistics for available sorties. It is important that the Marine commander be in position to make the allocation decisions.

Another issue is that today's amphibious warfare ships, the Navy ships that will constitute the sea base, were designed to stow a maximum amount of material and to conduct a rapid, complete, one-time offload. SBL requires selective, partial offload over a period of days or weeks.<sup>15</sup> Stowing material in such a way that selective offload is possible will reduce storage capacity by a significant percentage. If capacity is reduced to facilitate selective offload, the amphibious readiness group ships will not be able to load the advertised 15 days worth of material for the force ashore. The amphibs can be replenished at sea if the Navy has combat logistics force (CLF) ships available to replenish ships of an amphibious readiness group or amphibious task force. Currently CLF ships are considered to be carrier battle group assets and do not carry ordnance or stores for the Marines. Additionally, the combat logistics force is being reduced and studies of the number of CLF ships required by the Navy do not usually incorporate a requirement to support amphibious warfare ships serving in a sea-based logistics role.

Sea-based logistics would be facilitated if the sustainment requirements of the maneuver forces ashore were reduced. The goal of reduced resupply requirements suggests lighter forces ashore. One means of achieving lighter forces ashore is to have supporting fires provided by ships at sea rather than artillery ashore. Naval surface fire support today has a maximum range of about 13 miles. It will have a range of up to 63 miles (38 miles inland with the ship 25 miles offshore) with the Extended Range Guided Munition (ERGM) now scheduled for 2004. The Advanced Gun System for the DD-21 is planned to have a range of up to 100 nautical miles. The Land Attack Standard Missile, available in 2003, will have a range of 150 nautical miles. Tactical Tomahawk will have much greater range and a larger warhead, but with a unit cost of more than half a million dollars.<sup>16</sup> Marine combat operations 200 miles inland would seem to strain the notion that sustained fire support can be provided by ships at sea. The Navy is pursuing precision and timeliness over volume and duration for land attack missions.

The final issue is that the logisticians at the sea base must have visibility of all assets within the sea base and of those enroute to the sea base. Further, they need to be supported by decision support software that estimates the resupply requirements of the forces ashore before specific resupply is requested. They must be empowered to be proactive and be planning resupply rather than only responding to its request.

The “new” OMFTS, STOM, and SBL are concepts whose meaning is still open to discussion, interpretation, and analysis. There is, however, a case study of OMFTS that was quite real, relatively recent, and indicative of how difficult it can be to sustain a force ashore that is engaged in combat.

### **Logistics in the Falklands War**

For Great Britain, the Falklands War was the wrong war at the wrong time. Britain’s defense posture was focused on NATO requirements and operations on the Central Front in Europe. As for its timing, the 1981 Defence White Paper of the Secretary of State for Defence, Mr. John Nott, had called for the downsizing of the Royal Navy with the sale of its two aircraft carriers, phase out of the amphibious force, decommissioning of nine destroyers and frigates and a 15% reduction in endstrength.<sup>17</sup> Nonetheless, when confronted with the likelihood of an invasion of the Falkland Islands by Argentina at the end of March 1982, the Prime Minister determined immediately that Britain could not let such action go unchallenged.

Argentina invaded the Falklands on 2 April, 1982. No contingency plan for conflict in the Falklands existed. At a distance of 8000 miles from Great Britain, the islands could only be taken back by an amphibious assault supported by the Royal Navy; i.e., OMFTS. The carriers HMS Hermes and HMS Invincible were to be sold to India and Australia respectively, but were still in the service of the Royal Navy in April 1982. One of the two Royal Navy amphibious warfare ships, the LPD HMS Intrepid, had been “destored” and put into reserve status. This ship had to be hastily reactivated.<sup>18</sup> A fleet oiler, RFA (Royal Fleet Auxiliary) Tidepool, had just been sold to Chile and was

repossessed for use in the Falklands. Still there was a lack of purpose-built ships and some 54 ships taken up from trade (STUFT) were contracted and quickly converted. These ranged from ferries, to cruise ships, to tankers and container ships. They had to be fitted with some or all of the following: military communications gear, helicopter decks, water-making facilities, and equipment for refueling at sea. In almost every respect the logistics of this operation were quite remarkable, but the focus here is on the sea-based support of the forces fighting ashore.

As a statement of political resolve, ships had to get underway from the UK as quickly as possible. The carriers sailed on 5 April even though one of them had a locked shaft (the needed shaft bearing caught up with the ship later and was installed at sea). The sense of urgency to sail south is important to understanding that the ships were not combat loaded. They were loaded helter-skelter in the order of the arrival of equipment and material to the piers where the ships were docked. The working notion was that the ships would pause in their transit to the South Atlantic at Ascension Island and restow. Asset visibility also was a casualty of the speed in getting ships loaded and underway. A Logistics Regiment NCO was put aboard each cargo ship to try to determine, during the transit to Ascension Island, what each ship was carrying. This was only partially successful. Some captains would not allow anyone into the cargo holds while at sea and, where access was allowed, some holds were so tightly packed that much of the material could not be seen to be identified. Selective offload would have been impossible.

The 12-day pause to re-stow at Ascension Island was not entirely successful either. It would have been nice to offload the ships to piers, rationalize loads between ships, and then reload sensibly. However, there is no harbor or port at Ascension Island and the restow had to be undertaken at anchor during the daylight hours (ships put to sea at night for fear of Argentine submarines). Transfers between ships were done mostly with lighters because helicopter engine hours had to be conserved for the combat operations to come. Asset visibility was less than perfect and the imposition of “minimize” rules on naval message traffic did not match the need to pass long lists of what material was on what ship so loads could be rationalized. Minimize rules require



that only essential messages be transmitted and what was essential traffic was determined by the ship commanding officer. Many thought logistics information was less than essential. While a great deal of material was brought to Ascension Island by ship, more material was flown in daily from the UK. If material was addressed to a particular unit, material handlers at Ascension Island frequently did not know the ship in which the unit was embarked. If the material had only a requisition number, there was even more mystery and again material was loaded somewhat helter-skelter.

Given the lack of a contingency plan for the Falklands, an operation plan was developed as the ships sailed to the South Atlantic. At a Council of War held on HMS Hermes on 17 April at Ascension Island, it was decided that the amphibious landing would be on East Falkland and that Admiral Woodward's battle group must win the air and sea battles before the amphibious landing was attempted.<sup>19</sup>

The logistic concept was to keep supplies afloat to avoid having to pause at the shoreline to create a combat service support area; i.e., sea-based logistics. The concept also included use of the sea flank to reduce the helo lift required to resupply the ground forces as they battled their way toward their objective, Stanley. Vertical resupply was mandatory because wheeled vehicles could not travel over the peat bog and stone runs of the East Falkland landscape. Two landing ship logistic (LSL) ships were available and each held two days of supply of ammo, fuel, and rations for the commando brigade that would be the main landing force. The LSLs would remain near the beachhead as principal components of the sea base. A further four days and 16 days of supply were held on an RFA and a chartered ship respectively. These ships would be kept well away at sea under the protection of the battle group. The LSLs could either steam to the larger ships to replenish or those ships could replenish the LSLs at the beachhead as required. After discharging her troops, SS Canberra was to remain near the beachhead and fill the role of Main Dressing Station for the wounded.<sup>20</sup> The operation then was to be OMFTS with SBL. All of this of course assumed that the air and sea battles would be won prior to the amphibious assault.

While Admiral Woodward's battle group sailed south on 18 April, the amphibious group and logistic/transport ships remained at Ascension Island for restow and rehearsal. There were also problems caused by not having purpose-built ships to transport troops and their combat service support. 42<sup>nd</sup> Commando and the 3<sup>rd</sup> Parachute Battalion sailed in the P&O Line cruise ship SS Canberra and the 2<sup>nd</sup> Parachute Battalion sailed in the P&O ferry MV Norland. They knew how long it would take to offload Marines from amphibious warfare ships, but they did not know how long it would take to offload Marines from the commercial ships involved.

Admiral Woodward arrived at the 200-mile Total Exclusion Zone (TEZ) around the Falklands on 1 May.<sup>21</sup> In the early hours of that day, the war began with an RAF Vulcan bomber strike on the runway at Stanley and 12 Harrier sorties against that and other runways on East Falkland aimed at making them unusable to Argentine jet aircraft. On the second of May, the Argentine Navy cruiser General Belgrano was sunk in the TEZ by the submarine HMS Conqueror. This single event ended the involvement of the Argentine Navy in the conflict and thus won the sea war for the British. The air war was another matter.

On the 4<sup>th</sup> of May, the Argentine Air Force avenged the loss of the Belgrano by striking and mortally wounding the destroyer HMS Sheffield. Admiral Woodward had wanted to engage the Argentine Air Force prior to the arrival of the amphibious ships, and this he did though not with the outcome he would have desired. The Royal Navy could not win the air war against Argentine jet aircraft flying from the mainland because they had no early warning capability and their fighter aircraft, the Harriers, had limited endurance. Both these factors limited the ability of the Harriers to be in the right place at the right time to engage Argentine aircraft.

The amphibians and cargo ships sailed from Ascension Island on 7 May. By then it was clear that the air war would not be won prior to the amphibious landings. However, it was too late to change the logistic concept or the loading of ships. On 13 May it was decided that the landings would be in San Carlos Water on the western side of East



Falkland. On the 19<sup>th</sup> of May the landings were ordered to begin at 0230 hours on the 21<sup>st</sup> of May (times quoted are GMT and time in the Falklands is GMT minus 3 hours).

A week prior to this Admiral Woodward had ordered HMS Alacrity to steam through Falkland Sound from south to north, making noise and zigzagging. Woodward had to find out if the Argentines had mined the entrances to Falkland Sound. He had no mine warfare ships so he had to use a frigate for this purpose. There were no mines in Falkland Sound though the British had seen the Argentines lay mines off Port Stanley.

On the 20<sup>th</sup> of May some 50 ships representing the battle group, the amphibious group, and the STUFT ships assembled to the north of East Falkland. At 0230 hours on the 21<sup>st</sup> the two LPDs, seven escorts, MV Norland, SS Canberra, and two RFAs entered Falkland Sound. Four hours later the LSLs with three escorts and MV Europic Ferry entered the Sound. At 1240 hours the first wave of Argentine Mirage and Skyhawk aircraft attacked ships in the Sound. The attacks continued throughout the day with waves of up to eight aircraft each. They attacked combatant ships exclusively and ignored the amphibians, auxiliaries, and STUFT ships. All five battalions of troops were safely landed ashore but five combatants were hit during the attacks.

Sea-based logistics was also a casualty of the air attacks. The original plan had assumed air superiority. The air attacks on the 21<sup>st</sup> indicated that any ship in San Carlos Water in daylight was in grave danger. As a result, all non-essential ships were sent back to sea that evening. The non-essential ships included the LSLs and other RFA ships, and STUFT ships including Canberra and Norland, even though Canberra was to have remained in San Carlos Water to serve as the Main Dressing Station for the wounded. Additionally, Canberra and Norland departed with the unit stores of four battalions including 90,000 rations and all sorts of ammunition.

The land forces commander, Brigadier Thompson, suggests that Admiral Woodward should have been honest about there being little hope of winning the air battle prior to the amphibious landing.<sup>22</sup> He did not feel deceived so much as he felt he was

denied the opportunity to say, in advance of the landings, that SBL would therefore be infeasible and the ships would have to offload to the beach. This would tie up all movement assets for many days and significantly delay initiation of ground operations to reclaim the Falklands. Woodward was later most annoyed by the “pause at the beachhead.”

Henceforth logistics ships could only be offloaded at night by barge. The requirement to arrive and depart under cover of darkness meant that there were precious few hours to unload. Offload was largely by barge because the helicopters were not certified to operate from the civilian ships at night. The merchant ships were designed to carry containers and to offload in port. Breaking down containers and transferring their contents to a barge or landing craft for transport to shore in the dark was a slow process. The lack of purpose-built amphibious warfare and logistics ships hampered the entire operation. The Royal Navy also hampered the operation. Each night, Royal Marine logisticians would make requests for the specific ships they needed to unload the following night. The requests were based on the material needed and their records of what material was carried in which ships. Unfortunately, the Royal Navy cross-decked landing force material within the ships without telling the Marines ashore. Additionally, the ships requested were frequently not sent, or ships containing none of the needed material were sent in instead. Canberra, which held the unit stores of several battalions, did not return to San Carlos until June 4<sup>th</sup>. The commander of 42 Commando wrote, “The logistic plan had had to be fundamentally revised, from resupply directly off the ships to stockpiling thirty days’ worth of war stores ashore. With limited movement resources and an uncertain programme of ship movement into San Carlos each night, this was a logistician’s nightmare.”<sup>23</sup>

The result of all this was that the rate of build-up of the combat service support area was very slow and the start of the ground war was delayed. Surprise and initiative also were lost, but forces could not be committed to battle until the means to sustain them in combat were available. The situation was not appreciated by the overall commander at Northwood in the U.K., 8000 miles away, nor by the on-scene naval commander,

Admiral Woodward. During the protracted logistics buildup on the beach, Woodward fumed that his ships were falling apart and that Brigadier Thompson should get on with the job of defeating the Argentine forces ashore. However there were insufficient helicopters for tactical as well as logistic movements. An assault against Argentine forces at Goose Green scheduled for the evening of the 24<sup>th</sup> of May was canceled for lack of helicopter support. The forces could march to their objective but their artillery and ammunition required airlift. There were only 11 Sea King and 5 Wessex helos available. One Sea King was dedicated to the support of the Rapier antiaircraft missile systems setup ashore and four Sea Kings were dedicated to Special Forces operations. That left just six Sea Kings and the five Wessex helos for all other daily tactical and logistical missions. The Cunard container ship Atlantic Conveyor was bringing more helos, four heavy lift Chinooks and five more Wessex. On the 25<sup>th</sup> of May, however, the Atlantic Conveyor was sunk and only one Chinook survived.

While the logistic build up ashore was not yet completed, on the 26<sup>th</sup> of May Brigadier Thompson received orders from Northwood to start moving out from the beachhead immediately. The British objective was Stanley, some 80 kilometers east of the beachhead. The plan was to neutralize Argentine forces to the south at Goose Green and then to advance by foot and by helicopter easterly toward Stanley.

The operation on Goose Green that had been canceled earlier was re-ordered for the evening of the 27<sup>th</sup>. Also on the 27<sup>th</sup>, two battalions were ordered to march with all their gear 30 kilometers to Teal Inlet. They marched because there were too few helicopters to move them to their objective by air. During the two days and two nights of combat at Goose Green, logistics support of the battalion fighting took all available helicopter lift. There was insufficient helicopter lift for both combat service support and troop movement.

By the 29<sup>th</sup>, the battle at Goose Green had been won and the two battalions marching to Teal Inlet had arrived at their destination. Intelligence had indicated that Mount Kent, which is 50-plus kilometers east of San Carlos, was only lightly held.



Vertical assault would enable British forces to leap forward toward their objective. As soon as the battalions at Teal Inlet were resupplied, the helos would be available to lift troops from San Carlos to Mount Kent. Four Sea King helos and the Chinook were to be available for limited sorties over several nights. The four Sea Kings were the same helicopters that had been dedicated to Special Forces operations; they were the only four with crews trained in night-vision techniques. 42 Commando, still at San Carlos, was tasked on the evening of the 28<sup>th</sup> to seize Mount Kent on the night of the 29<sup>th</sup>. On the afternoon of the 29<sup>th</sup> there was much concern because the availability of the helos could not be verified. The Brigade Commander owned and therefore controlled the trucks his forces would have used in Europe, but he did not own the helicopters on which the mobility of his forces depended in the Falklands. The helos were controlled by the Amphibious Warfare commander who remained at sea onboard HMS Fearless, one of the two LPDs. The Brigade Commander and his logisticians could not even access the helicopter communications network.<sup>24</sup> It turned out that weather, blizzard whiteout conditions, prevented the operation on the night of the 29<sup>th</sup>. The operation was almost canceled the next night because the helos were over-committed. Not only did the troops need to be airlifted to the objective, but artillery and ammunition had to be flown to the objective as well.

After lifting one company of troops onto Mount Kent, the Chinook that had lifted mortars and 105 mm artillery reported undercarriage damage that would have to be repaired before further sorties could be flown. That left only the four Sea Kings and only one further troop lift. Thereafter the remaining available sorties had to be devoted to moving ammunition pallets. "Weight and safety restrictions were ignored as troops piled in atop mounds of missiles, bombs, grenades and ammunition."<sup>25</sup> Elements of 42 Commando took Mount Kent the night of May 30-31.

With two battalions at Teal Inlet and its high ground secured, on the 2<sup>nd</sup> of June a brigade maintenance area was established there and LSLs brought in supplies thus shortening the line of communication to the forces at Teal Inlet and those on Mount Kent.

A forward arming and refueling point also was established to shorten the distance helicopters had to fly to refuel.

On the 4<sup>th</sup> of June, a second brigade of troops arrived at San Carlos. At the Council of War at Ascension Island on 17 April it had been decided that another brigade was required to reduce the numerical odds from 2:1 against the British to about even. The other brigade was the 5<sup>th</sup> Infantry Brigade and it had come down on the Cunard liner QE 2 to South Georgia Island where they transferred to SS Canberra. The 5<sup>th</sup> Infantry was tasked to move on the southerly axis from the Fitzroy/Bluff Cove area to Stanley. Helicopter sorties were not available for vertical deployment to Fitzroy and it would have taken two days to march there. It would, however, take only five hours to move troops from San Carlos to Fitzroy by ship. A full-scale amphibious landing had been requested but turned down by Northwood. With a smaller landing not explicitly forbidden, 560 Scots Guards embarked in the LPD HMS Intrepid the evening of the 5<sup>th</sup> of June. Early on the 6<sup>th</sup>, Intrepid arrived off Lively Island and there launched her four LCM landing craft loaded with the Scots Guards for the 35 mile run to Fitzroy.<sup>26</sup> The weather was quite ugly and it took seven hours to reach Fitzroy. The troops were seasick and soaked through to the skin when they arrived.

Early on the 6<sup>th</sup> at San Carlos the LSL Sir Tristram loaded ammunition for Fitzroy and Welch Guards began to embark in the other LPD, HMS Fearless. At 0300 on the 7<sup>th</sup>, Fearless arrived off Lively Island with her 560 troops. Intrepid's LCMs had not returned from Fitzroy, so Fearless launched her two LCMs and half of the embarked troops began yet another ghastly journey to Fitzroy. Back in San Carlos later on the 7<sup>th</sup> the Welch Guards that could not disembark Fearless embarked in the LSL Sir Galahad for a second attempt to get to Fitzroy. The LSLs are small, 5700 ton full displacement logistic ships operated by the Royal Fleet Auxiliary and have no LCMs with which to carry troops to shore. Consequently on the morning of the 8<sup>th</sup> of June Sir Galahad dropped anchor off Fitzroy nearby Sir Tristram who had anchored there early on the morning of 7 June. Unloading troops or ammunition from either ship was delayed awaiting arrival of LCMs that had landed troops from Fearless and Intrepid. Around noon on the 8<sup>th</sup> the weather,

which had been quite nasty for the past several days, cleared making the presence of the two LSLs (without escorts) painfully evident to Argentine forces ashore. The first of the LCMs did not arrive until 1530 in the afternoon. At 1610 Argentine A-4 Skyhawks arrived and attacked the essentially defenseless and unwarned LSLs at anchor. Sir Galahad was fatally damaged, Sir Tristram was badly damaged, 54 soldiers and sailors were killed, and over 200 were wounded.<sup>27</sup> The failure to provide escorts and the lack of air superiority was especially costly in this instance.

While a disaster, the landing of troops at Fitzroy did serve to make the Argentines think that the main thrust on Stanley would come from the easier southwestern direction whereas the main thrust was actually along the tough northerly approach. The northerly route began with Mt. Kent and proceeded in a generally easterly direction to Mt. Challenger, Mt. Wall, Mt. Harriet, Two Sisters, and Mt. Tumbledown overlooking Stanley. The next major action along the northerly route was the assaults on Mt. Harriet and Two Sisters just after midnight on 12 June. It was intended that the Scots Guards from the 5<sup>th</sup> Brigade, landed at Fitzroy, should attack their objective, Mt. Tumbledown, the next night. Part of the reason for the pause between the seizing of Mt. Kent on the night of 30-31 May and the assault of Mt. Harriet and Two Sisters on the night of 11-12 June was to accomplish a logistics build-up for the final battles aimed at, among other things, stocking all artillery batteries with 480-500 rounds per gun.<sup>28</sup>

Artillery shells are carried on pallets (a pallet is 24 complete rounds of 105 mm ammunition).<sup>29</sup> The Wessex helicopter could lift only a single pallet, the Sea King two pallets, and the Chinook six pallets. There are six guns per battery and 480 shells each totals 2880 shells or 120 pallets of shells. Thus to supply 480 rounds per gun to one artillery battery required 120 Wessex sorties, 60 Sea King sorties, or 20 Chinook sorties. Recall that the numbers of these helicopters was only five, six, and one respectively. It is clear that vertical replenishment of artillery shells put a tremendous strain on available helicopter sorties.



In the assault on Mt. Harriet, 42 Commando was served by, in addition to its own artillery, naval fire support from HMS Yarmouth. It was estimated that Yarmouth's twin 114-mm (4.5 inch) guns provided the fire equivalent of a battery of six 105-mm artillery.<sup>30</sup> Following the attack on Mt. Harriet, the artillery positions were extremely low on ammunition. It would take another day to restock and then to only about 250-300 rounds per gun. The commander of the 5<sup>th</sup> Brigade asked for and received a 24 hour delay in undertaking his assault. The assault against the Argentine Marines holding Mt. Tumbledown was made on the night of 13-14 June. One battery of artillery almost ran out of ammunition. Resupply had to be flown in, in conditions of darkness and a snow storm. The Argentine Marines were neither surprised nor unprepared and fought ferociously on Mt. Tumbledown. Their defeat led to the commander of Argentine land forces in the Falklands, Major General Menendez, to surrender on the morning of the 14<sup>th</sup> of June.

## **Conclusion**

Much of the discussion of OMFTS, STOM, and even SBL has focused on the new capabilities the MV-22 tiltrotor aircraft and the Advanced Amphibious Assault Vehicle will bring to amphibious warfare. Much of the study of sea-based logistics has focused on replenishment ton-miles arithmetic and whether the air assets of the ships of the sea base can generate the lift required. However, the appeal of the MV-22 is in the deployment and movement of troops rather than as a lifter of external logistics loads. In any case, the viability of OMFTS, STOM, and SBL depends on a much broader set of issues. These were described and then the Falklands War was examined to see how the issues impacted on the conduct of that operation.

The Falklands War was OMFTS and sometimes STOM, where STOM stood for shore to objective maneuver rather than ship to objective maneuver. It was intended to be SBL, but SBL was not possible. The first lesson from the Falklands is that both sea control and air superiority are required for sea-based logistics. The British had sea control but not air superiority and had to keep the logistics ships out of Argentine jet

aircraft range except at night. This meant that a combat service support area had to be established ashore and this created a lengthy pause at the beachhead.

Once ashore, the competition for aircraft sorties between the need to move troops and the need to move guns, ammunition, fuel, and even rations affected the pace of operations on the ground. There will always be a competition between logistics and operations for lift assets but commanders are not taught this. The Falklands land forces commander noted that “exercises don’t force commanders to choose between moving men and moving beans, bullets and fuel.”<sup>31</sup>

In the Falklands, the land forces commander who needed to make the tradeoffs between using the aircraft for troop movement and logistics did not control the aircraft and did not even have access to the aircraft communications network. The aircraft were controlled by the Amphibious Warfare commander who remained at sea. The command and control arrangement involving an overall commander who was 8000 miles distant and separate on-scene commanders for the naval battle group, the amphibious group, and the land forces contributed to the lack of understanding and mutual support required in expeditionary warfare. In his book written ten years later, the Falklands battle group commander, RADM Woodward, wrote 351 pages without ever using the word logistics. During the conflict, his notes indicate that he complained extensively about the lack of action by the ground forces while his ships were “falling apart” from their extended operations at sea. He called the ground force commanders “ceremonious duffers” and their slow pace “absolutely appalling.”<sup>32</sup> This was because he had absolutely no appreciation of logistics. In his book he admits that he was substantially ignorant of conditions ashore.

The conclusion of this review is that many capabilities are required to successfully execute sea-based logistics. The Navy must attain and maintain sea control and air superiority or the ships of the sea base could be at risk. Mine countermeasures capability must be present or use of the surface for force deployment or resupply could be foreclosed. Air superiority and the suppression of enemy air defenses are necessary if



vertical deployment and/or resupply are planned. Asset visibility and the ability to selectively offload the ships of the sea base over time are mandatory. The competition between operations and logistics for aircraft sorties must be managed. Replenishment of the ships of the sea base must be feasible as required; that is, there must be combat logistics force ships carrying Marine ammunition and stores available for this purpose. Finally, the Navy and Marine Corps must have a rational command and control scheme and be well practiced in expeditionary warfare operations.

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<sup>1</sup> W.R. Carter, *Beans, Bullets and Black Oil*, United States Government Printing Office, 1953, reprinted by the Naval War College Press, Newport, RI, 1998, page 1.

<sup>2</sup> Concepts Division, Marine Corps Combat Development Command, *United States Marine Corps Warfighting Concepts for the 21<sup>st</sup> Century*, Quantico, undated, circa 1998.

<sup>3</sup> Naval Studies Board, National Research Council, *Naval Expeditionary Logistics: Enabling Operational Maneuver From The Sea*, National Academy Press, Washington, DC, 1999, Executive Summary

<sup>4</sup> Center for Naval Analysis, *Project Culebra: Sea-Based Combat Service Support for Ship-to-Objective Maneuver (Supply and Transportation Analysis)*, CRM 95-144, Alexandria, September 1995.

<sup>5</sup> Naval Studies Board, Statement of Task.

<sup>6</sup> Lt. Mark W. Beddoes, USN, *Logistical Implications of Operational Maneuver From The Sea*, masters thesis, Naval Postgraduate School, March, 1997; also appeared in the Naval War College Review, Autumn, 1997, pp. 32-48.

<sup>7</sup> Capt. Robert M. Hagan, USMC, *Modeling Sea-Based Sustainment of Marine Expeditionary Unit Operations Ashore*, masters thesis, Naval Postgraduate School, September 1998.

<sup>8</sup> Col. Charles O. Skipper, USMC, *Can We Fuel OMFTS?* Marine Corps Gazette, January, 1997.

<sup>9</sup> Norman Betaque, et al, *Logistical Support of Operational Maneuver From The Sea*, Working Paper prepared for the Naval Studies Board, July 1995, page 5.

<sup>10</sup> Capt. Norman L. Reitter, USMC, *A Decision Support System for Sea-based Sustainment Operations*, masters thesis, Naval Postgraduate School, September 1999.

<sup>11</sup> For example, the Naval Studies Board study of Naval Expeditionary Logistics said “. . . new logistics information systems will have to be developed to provide real-time data and decision support capabilities that logistics commanders will need to plan and control,” p. 2 of the Executive Summary.

<sup>12</sup> Capt. Phillip Tucker, USMC, *How Will We Escort the MV-22?*, Naval Institute Proceedings, November, 1999, pp. 36-39.

<sup>13</sup> The Marine Corps Concept Paper on Ship To Objective Maneuver indicates aircraft launch and recovery areas at sea up to 50+ nautical miles from the shore. The Statement of Task for the Naval Studies Board study of Naval Expeditionary Logistics called for sustaining forces from the shoreline to 200 miles inland.

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- <sup>14</sup> Joint Operational Requirements Document for the Joint Multi-Mission Vertical Lift Aircraft, Annex A, Key Performance Parameters. See also the MV-22 NATOPS Flight Manual, Naval Air Systems Command, AIR-4.3.2.2, 23 November 1998.
- <sup>15</sup> Concepts Division, Marine Corps Combat Development Command, page II-22 and page XI-8.
- <sup>16</sup> Assistant Chief of Naval Operations (Surface Warfare), *Surface Warfare Vision*, briefing on CD, January 2000, slides # 45, 48, 52, and 55.
- <sup>17</sup> Admiral Sir Sandy Woodward, RN(ret), *One Hundred Days*, Naval Institute Press, Annapolis, 1992, pp. 61-62.
- <sup>18</sup> Woodward, p. 92
- <sup>19</sup> Major General Julian Thompson, Royal Marines (ret), *The Lifeblood of War: Logistics in Armed Conflict*, Brassey's, Oxford, 1991, page 260-261.
- <sup>20</sup> Ibid., page 266.
- <sup>21</sup> The chronology and events of the Falklands War are available from many sources. This report has relied mainly on the books written by the naval battle group commander (Woodward), the land force commander (Thompson), and the commander of 42 Commando (Vaux).
- <sup>22</sup> Ibid., page 269
- <sup>23</sup> Major General Nick Vaux, Royal Marines, *Take That Hill*, Pergamon-Brassey's, London, 1986, page 93
- <sup>24</sup> Thompson, page 276
- <sup>25</sup> Vaux, p. 109.
- <sup>26</sup> Woodward, p. 314
- <sup>27</sup> Thompson, p. 284
- <sup>28</sup> Ibid., p. 285
- <sup>29</sup> Ibid., pp. 372-374
- <sup>30</sup> Vaux, p. 163
- <sup>31</sup> Thompson, p. 287.
- <sup>32</sup> Woodward, p. 325.

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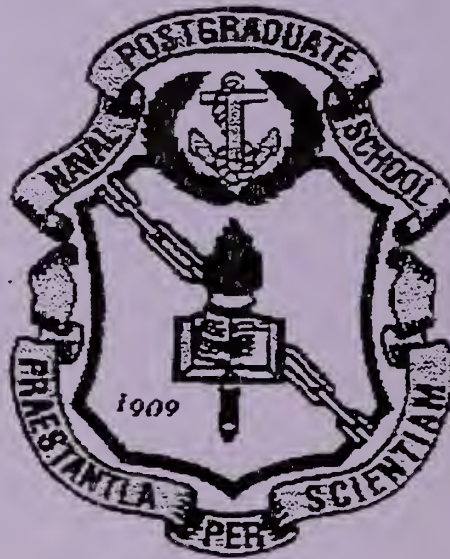




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